

10 Natural resources

10.1 Introduction

Natural and environmental resources help define the character of the township, support the natural systems that provide for wildlife and a healthy environment, provide recreational and educational opportunities, and form the basis of its economy. This begins with unique soils, Lake Erie, stream valleys and watersheds, remaining wooded tracts, and species habitats. At the same time, the township's natural resources must be safeguarded from adverse impacts of urbanization. This includes flooding, air and water pollution, groundwater contamination, noise, light and glare, and visual clutter from signs and utility structures.

The Natural Resources element, addresses rivers, streams, watersheds, woodlands and urban forestry, air quality, noise pollution and light pollution, to ensure that the natural features that define Madison Township are protected and enhanced. The intent of this element is to promote the conservation and integration of natural systems and resources with a growing residential population, and reduce the impacts of man-made development on the community, property and lives of the residents.

10.2 Lake Erie

Lake Erie, the great body of fresh water forming Ohio's north coast, is the fourth largest of the five Great Lakes and the 12th largest freshwater lake in the world.

The common perception may be that Lake Erie is a timeless entity, formed in the distant past and as ancient as any visible rock or landscape, and a feature that will remain essentially unchanged for eternity. Geologists, however, view Lake Erie in its present form as a very recent feature – less than 4,000 years old -- that is destined for a relatively short life, geologically speaking. The known history of the lake and its predecessors has taken place in the last 14,000 years.

The presence of Lake Erie was downplayed in the 1960 Lake County Comprehensive Plan. The future land use map of the 1960 plan envisioned the Lake Erie coastline as being an area lined with medium-to-high density residential uses and heavy industry, with only a few areas left untouched by development.

The scale of development predicted in the 1960 plan never took place. Today, much of the land along the lakefront remains undeveloped. Residents and businesses are increasingly recognizing that Lake Erie is a rich resource, providing both a natural habitat with few equals and a catalyst for future sustainable economic development – if it is carefully managed. The Lake County Planning Commission, citizen groups, local government agencies and the State Department of Natural Resources have been working to avoid and reverse the mistakes of the past, and maintain a healthy balance between the wise use and thoughtful protection of the resources of coastal Lake Erie.

The Eastern Lake County Coastal Comprehensive Plan was completed in August 2003. The study region of this includes an area 1000 feet shoreward of Lake Erie between the Lake-Ashtabula county line and the City of Mentor-Painesville Township boundary. The report inventories existing conditions and current and proposed projects, and also examines current and projected needs within the study area.

A second, more detailed study, The Lake County Coastal Development Plan was completed in 2005. In summary, the plan describes the overall coastal environment and documents a plan in response to this environment resulting in an accessible, economically viable and locally relevant Lake County coastline. The creation of the plan is intended to:

- Lead to enhanced grant award leverage created by a regional effort.
- Serve as a catalyst for landside planning of projects at the local or regional level.
- Facilitate the selection of specific coastal projects for implementation.

Although the plan deals mainly with coastal area development, it makes the following recommendations regarding natural resources.

- Local governments should assess their coastal areas, and determine what they need to protect.
- Parkland acquisition costs should include funding for shoreline stabilization projects.
- Develop shoreline protection projects.
- Restore the Fairport Harbor breakwall.
- Overall protection of historic and cultural sites, beaches, scenic views, natural resources, natural features and recreational opportunities, as well as the lake itself.
- Control non-point source pollution and stormwater runoff.

EROSION

Although it has been millennia since the end of the Ice Age, the lake and coastline continue to be shaped through the natural process of erosion.

Lakeshore erosion is the predominant geologic hazard at certain locations in Madison Township. Steep bluffs are formed where the waves impact the land. The height of the bluffs varies in the township. High bluffs along the Lake Erie shore are also subject to other natural processes. The most dramatic process is called slumping. High bluffs fail naturally, and through time will eventually attain a natural stable angle of repose, or a stable slope. As the bottom of a bluff is cut away by erosion, the weight of bluff materials will cause the face of the bluff to break free. When this happens, large blocks of bluff material will

That's a lot of H₂O

The Great Lakes contain about 1/5 of all the freshwater on the planet. They contain 95% of the nation's supply of fresh water.

If all the water within the Great Lakes was spread evenly across the United States, the country would be covered under 9.5 feet (3 meters) of water.

Sizing up the Great Lakes

The Great Lakes extend 575 miles (925 kilometers) from the northern tip of Superior to the southern shore of Lake Erie, a spread of eight degrees in latitude.

From east to west, the Great Lakes extend more than 800 miles.

The Great Lakes have more than 10,000 miles (16,000 kilometers) of shoreline, longer than the entire Atlantic and Pacific coasts of the USA.

Lake Erie – Our Great Lake County, Ohio

Lake Erie is the 12th largest freshwater lake in the world.

Lake Erie has 871 miles (1,400 kilometers) of shoreline. There are 262 miles (421 Kilometers) of shoreline in Ohio and at least 26 islands in the western basin of Lake Erie. The exact number varies depending on water levels.

Lake Erie is the most southern, shallowest, warmest and most biologically productive of all the Great Lakes.

Lake Erie supplies more fish for human consumption than the other four Great Lakes combined. The Lake Erie walleye sport fishery is widely considered the best in the world.

Lake Erie's deepest point is 210 feet (64 meters). Lake Erie has three basins: the western basin includes the islands area, the central basin extends from the islands to Erie, PA, and Long Point, Canada, and the eastern basin extends from Erie, PA, to the east end of the lake. The western basin averages 80 feet (24 meters) in depth.

Lake Erie is 241 miles (387 kilometers) long with a widest point at 57 miles (92 kilometers) and the narrowest point at 28 miles (45 kilometers). It covers 9,910 square miles (25,667 square kilometers) and drains 30,140 square miles (78,062 square kilometers).

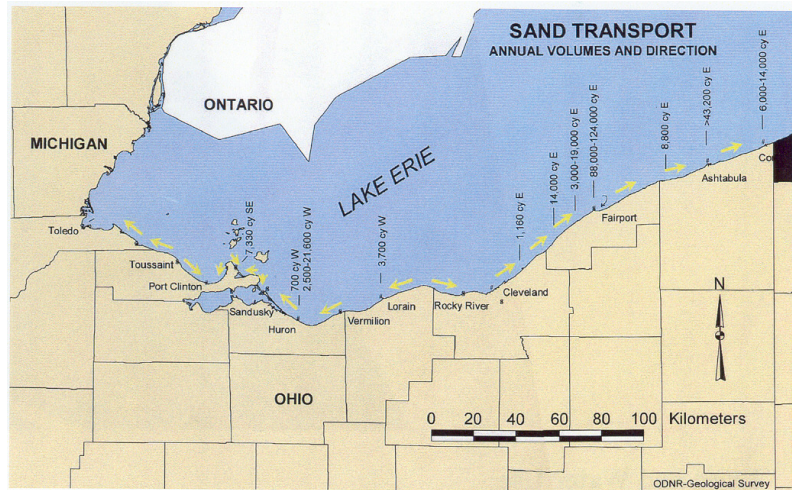
Ninety-five percent of Lake Erie's water comes from the upper Great Lakes via the Detroit River.

A drop of water entering Lake Erie from the Detroit River will take only two and a half years to reach Niagara Falls. Compare this short time to Lake Superior where a drop of water will take 191 years to move out of the lake.

Source: Lake Erie Coastal Ohio Fact Sheet

collapse and fall into the lake. Waves will scour away silts and clays, leaving behind sand and stone. This is a natural beach-building process. The loss of sand caused by entrapment, groundwater seepage, surface water runoff, and human activity or changes in land use that would alter the hydrology or vegetation on a site can accelerate slumping.

Sand loss also has an effect on the slope beneath the water. Since beaches in the study area are narrow, there is little sand on the lake bottom to absorb wave energy. As a result, waves excavate the lake bottom close to shore. As near-shore depths increase, the amount of wave energy increases, thus increasing erosion along the shoreline.



Sediment Transport Diagram (Source: ODNR Geological Survey)

Previous efforts to slow or stop erosion have met with limited results. Excessively long groins trap sand that would have been deposited on the downdrift shore, making those areas more susceptible to erosion; there is less sand available to buffer wave action. Owners of lakefront property in the Lake County area have often taken inappropriate measures to stop erosion, such as dumping construction debris and large objects on the beach. However, dumped material will often get stirred up during a storm, gouging out more of the shoreline and accelerating slumping.

The US Army Corps of Engineers recommends several low-cost methods of protecting shoreline property. Beach fill, creating gently sloped beaches, will cause incoming waves to break and use up their energy before reaching inland areas. Perched beaches use low retaining walls to trap sand, creating a new beach for recreation and shore protection are also suitable protection measures.

Well-designed offshore barrier islands or breakwaters dissipate the energy of incoming waves, trapping sand behind them without concentrating destructive wave action elsewhere. This is recommended for Stanton Park and Township Park.

Groin fields trap and retain sand, nourishing the beach compartments between them; however, they should be designed in a way where they will not cause unacceptable erosion of the downdrift shore. The natural sediment transport is west to east. Inappropriate protection measures often deprive neighboring properties to the east sand needed to maintain natural protection that a beach provides. Revetments are engineered structures placed on steeper banks or bluffs in a way to absorb the energy of incoming waves, without redirecting wave energy to unprotected areas. This plan recommends the off-shore barrier protection strategy for future erosion control and beach creation exercises in Madison Township.

10.3 Watersheds, waterways and wetlands

WATERSHED

A watershed is an area designating where water will flow. If it rains along the Lake Erie shoreline, the water will flow directly into Lake Erie. If it rains in the center of the Village, water will flow into a stream that leads to Arcola Creek, and eventually enter Lake Erie.

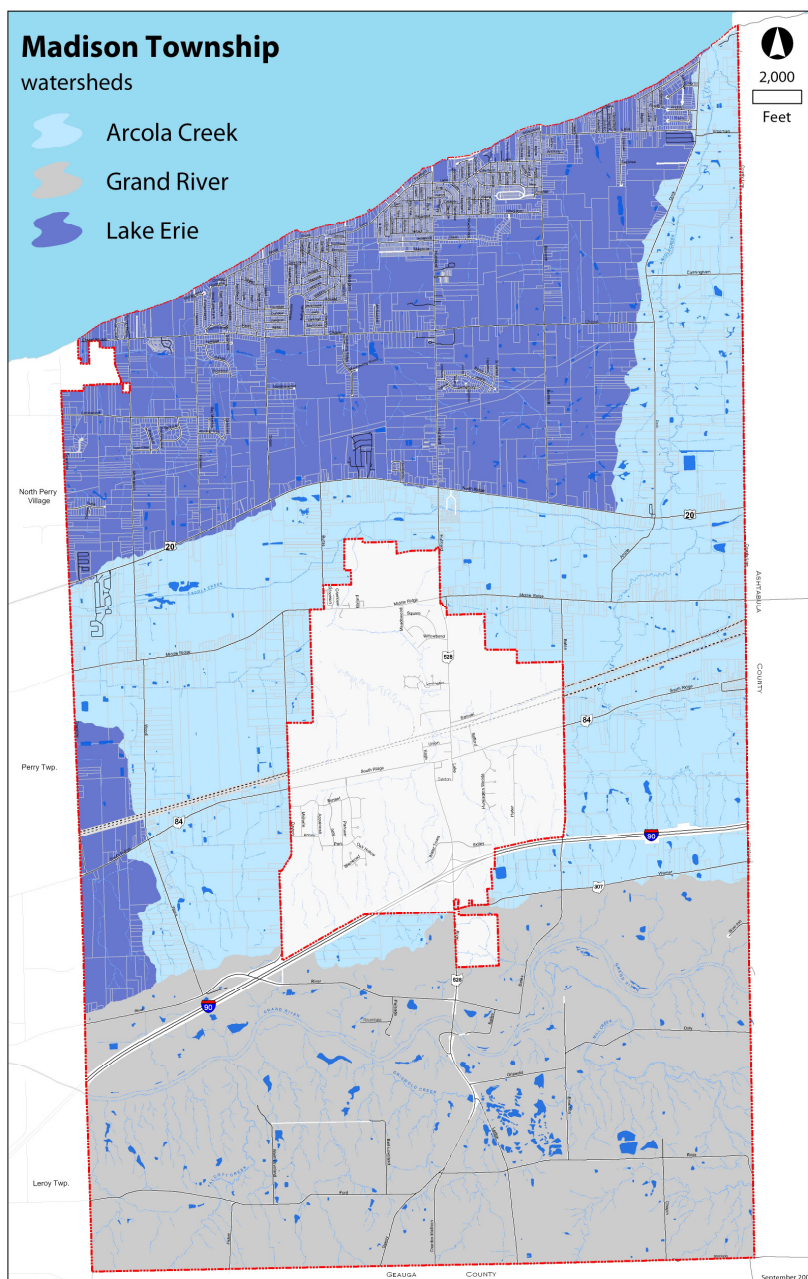
Madison Township is situated in three major watersheds; Lake Erie, Arcola Creek and the Grand River.

EFFECTS OF SUBURBAN DEVELOPMENT

Suburbanization in a watershed can have adverse effects on streams and receiving waters. Effects include increases in flooding, stream bank erosion, and pollutant transport. Development results in surfaces such as rooftops,

roads and parking lots, which render much of a watershed impervious to rainfall. Rainfall is unable to percolate into the soil, and instead is converted into runoff, which can overwhelm the existing drainage system of natural stream tributaries. Thus, drainage improvements, such as curbs, channels, or storm sewers, must be constructed to direct and convey the runoff through the watershed.

At the receiving end of the stormwater conveyance network, a stream channel must adapt to new hydrologic conditions. The primary adjustment is through channel widening, which occurs through stream bank erosion. Stream banks become undercut and slump into the channel. Trees that once provided bank stability become exposed at the roots and are more likely to fall, further destabilizing adjacent land. Large quantities of sediment eroded from



stream banks remain in the channel as shifting deposits of mud and sand. This can have a dramatic impact on habitats of fish, mussels and aquatic insects.

Other changes accompanying suburbanization, such as changes in water temperature, oxygen levels, and pollutants carried in the runoff, can also adversely affect aquatic wildlife. In the natural system, pollutants in the runoff are removed from the water as it soaks into the ground or flows through the organic litter at the soil surface. With urbanization, these areas are replaced with pavement and buildings, and deposited pollutants are washed directly into stream channels. Pollutants in urbanized streams are frequently ten times higher than in pre-development streams. These pollutants and conditions include suspended sediment, nutrients (phosphorus and nitrogen, usually from fertilizer and equestrian waste), oil and grease, trace metals, chlorides or salts, and thermal effects due to reduced vegetation cover over the stream. These pollutants and conditions affect not only the receiving stream, but also downstream waters, such as wetlands and Lake Erie.

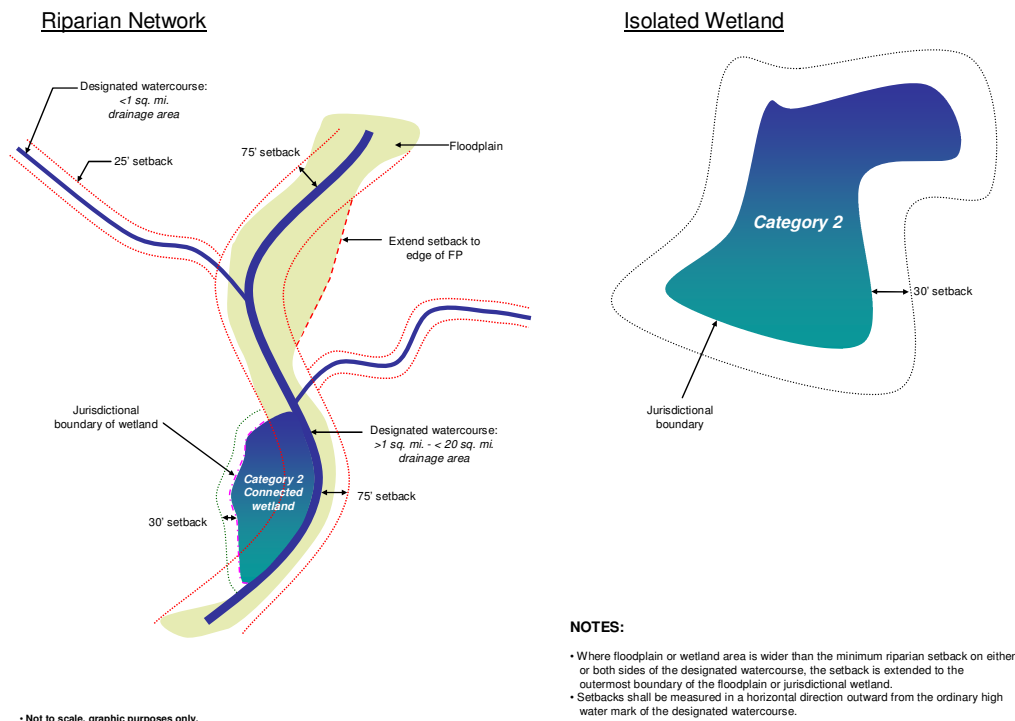
Madison Township is managing stormwater through requirements implemented during the permit process for new development and through assistance provided by the Lake County Stormwater Utility Department. The Township Service Department and Stormwater Utility department have been actively maintaining and cleaning multiple ditches throughout the Township. Other tools include detention basins that temporarily store and slowly release runoff from large storms to reduce peak stormwater discharges, and restricting development in stream floodplains that are susceptible to frequent flooding. While both approaches have been effective in curtailing flooding problems, they cannot entirely mitigate the impact of urbanization on stream habitat through increased pollutant transport.

RIPARIAN SETBACKS

Riparian areas are naturally vegetated lands along rivers and streams. When appropriately sized, these areas can limit stream bank erosion, reduce flood size flows, filter and settle out pollutants, and protect aquatic and terrestrial habitat. Riparian setbacks are a tool local governments can use to maintain riparian area functions. These can also apply to designated wetlands.

Madison Township can establish riparian setbacks through a combination of landowner education, land acquisition, and land use controls on new development. The Lake County Planning Commission, Lake County Soil and Water Conservation District, land trusts, and other organizations are skilled in assisting communities and landowners with education and

acquisition efforts.



The setbacks are derived using the Chagrin River Watershed Partner's model setback ordinance.

Riparian setbacks should:

- Range from 25 feet to 300 feet depending on watercourse drainage area.
- Minimum distances and apply to both sides of designated watercourses.
- Conform to community land development patterns & natural resource management goals.
- Include provisions for communities to examine the combined impact of all setbacks (side yard, rear yard, riparian, etc.) in a subdivision or a parcel and make reasonable adjustments to ensure existing lots remain buildable, and to maintain lot yields from new subdivisions to the extent possible.

The draft zoning resolution that is part of the US 20 Corridor Plan includes the following standards for riparian setbacks in the township.

- Grand River, Lake Erie: 300 feet
- Arcola Creek: 200 feet
- Other watercourses draining an area of more than 0.5 square miles: 75 feet
- Watercourse draining an area of less than 0.5 square miles: 25 feet
- Where the 100-year floodplain is wider than a minimum riparian setback area along a watercourse, the setback distance is extended to the outer edge of the floodplain.
- Where a wetland is identified in a minimum riparian setback area, the setback distance is extended to the outermost boundary of the wetland.

WETLANDS

Wetlands are important components for water quality and quantity. According to the US EPA, wetlands provide water quality protection, fish and wildlife habitat, natural floodwater storage and reduction in the erosive potential of surface water.

In Ohio, 90% of the original wetlands have been destroyed since the 1800s. Locally, development pressures have disturbed a large amount of natural wetlands.

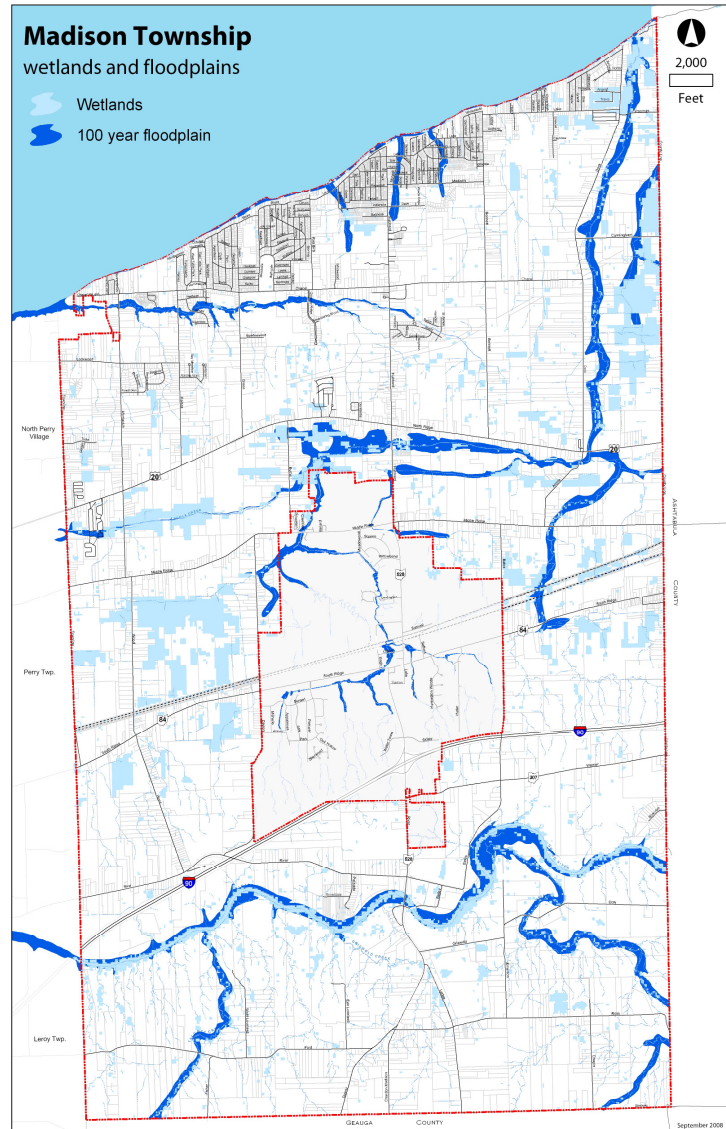
Mitigation is required for developers who disturb wetlands on site, but the creation of new wetlands often occurs outside of the watershed that has been impacted. A local wetland mitigation bank would be an extremely valuable asset for Madison Township and Lake County as a whole.

NONPOINT SOURCE POLLUTION

Nonpoint source (NPS) pollution comes from many sources in both urban and rural areas. Runoff from cropland, parking lots, lawns, mines, and septic systems often contribute to NPS pollution. Pollutants are transported to the surface and ground water by rainfall. During large storms, the runoff to surface water and infiltration to ground water increases, as does the rate of pollutant movement.

A large source of groundwater pollution comes from the overuse of agricultural chemicals. Fertilizers and herbicides, such as atrazine, are applied to fields to enhance crop yield. However, only limited concentrations of these chemicals are needed to be effective. Excess compound will remain in the soil, where they may degrade or adhere to soil particles. Any compound remaining unattached to the soil will eventually travel to an aquifer.

Increasingly, NPS pollution originates from urban uses, such as suburban lawns and gardens, street and parking runoff, and construction sites. Urban areas often don't have enough vegetation to slow the rate of contaminant travel. This is evident in areas with high amounts of impervious surface, such as the US 20 corridor in Madison Township. This can lead to a faster contamination rate where more highly concentrated pollutants are transported into aquifers.



The Ohio Department of Natural Resources recommends using best management practices to reduce nonpoint source pollution. Best management practices are a management strategy that incorporates both engineering and cultural techniques that have been effective and practical in reducing water contamination. Best management practices include the timely and careful application of fertilizers and pesticides, the construction of filter strips surrounding fields that border a surface water source, and creation and protection of wetlands, which act as filters cleaning sediment, nutrients, and other NPS pollutant

ARCOLA CREEK WATERSHED PLAN

The Arcola Creek watershed drains 23 square miles of land in Madison and Perry Townships, including most of the US 20 corridor area. The watershed contains one of only two of the remaining estuaries on the south shore of Lake Erie.

In response to encroaching development that threatens the ecosystem of the creek and its watershed, the Lake County Soil and Water Conservation District adopted the Arcola Creek Watershed Plan in 2004. The watershed plan recommends changing some land use regulations to protect the watershed, including the following:

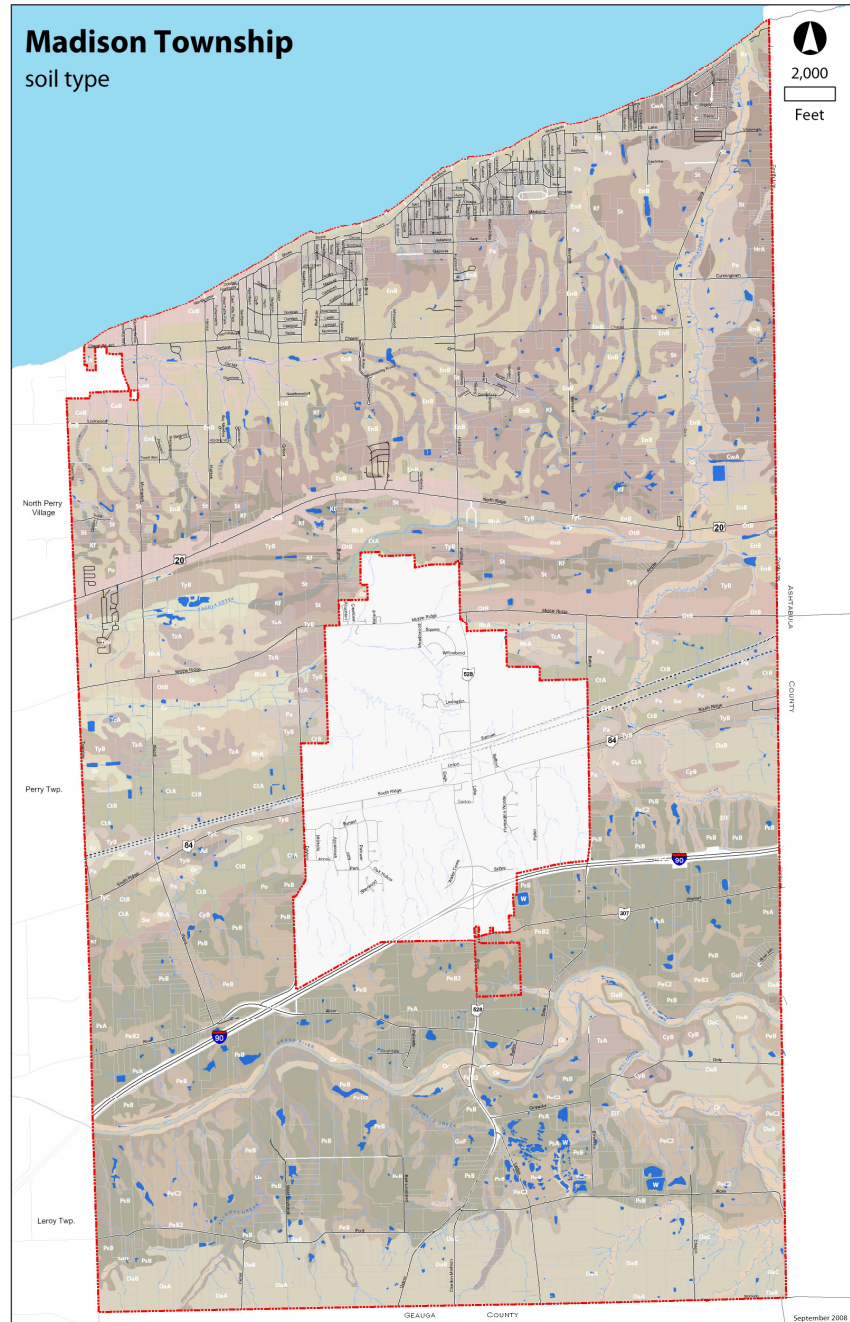
- Require riparian setbacks for impervious surface (parking lots and other paved areas), to reduce the velocity of stormwater runoff, and minimize nonpoint source pollution (polluted runoff, including oils and solvents on parking lot surfaces, lawn fertilizer, and bacteria from septic systems and animal waste.)
- Create an Arcola Creek floodplain overlay, to restrict building in the 100 year floodplain area.
- Prohibit fill in the 100 year floodplain area, to increase the amount of floodwater storage capacity. The plan states “Other suitable uses for these areas are agricultural fields, recreation area, and woodlots.”
- Require impacted wetlands in the watershed to be offset by mitigation elsewhere in the Arcola Creek watershed.

This plan recommends implementing all of the above.

10.4 Soils

Soils maps of Lake County were prepared by the Ohio Department of Natural Resources in 1973. The maps show twenty-five different soils, including silts, loams, shales, sands, gravels and clays and indicate data on water tables, flood districts and slopes.

Madison's land conformation was influenced strongly by glacial action. Three distinct soil zones have formed from glacial till and lake deposits. The three soil zones are divided by ridges which once were beaches of the lake. The first zone lies between North Ridge Road/US 20 and Lake Erie, where soils are predominantly sandy, unstable, seasonally wet and susceptible to erosion. Arcola and Church Creeks flow through this zone and flood periodically. The soils of the flood plains are rich silt or sandy loam.



North Ridge Road/US 20 stretches along a glacial ridge which forms the second soil zone boundary. Soils of this ridge south to South Ridge Road are sandy and gravelly, and were formed as beach deposits. A high water table, low moisture capacity, and rapid erosion are characteristics of the soils in this zone.

The third soil zone lies south of South Ridge Road. Soils here are quite different because the prehistoric lake extended only to the south ridge. The soils are silt and clay loam and weathered shales. A very high water table is present here as elsewhere and slow

permeability, frost heaving and difficulty in working the soils are commonly encountered.

Three glacial ridges in the township (north ridge, middle ridge, south ridge) provide the only consistent relief from the high water table. The soils on all three ridges are composed of sandy beach deposits and are well drained with little water runoff.

The soils are classed for potential use and discussed in this section in terms of limitations to construction, agricultural use and for production of nursery stock. The following table shows that the least amount of acres in each of the categories is given a slight limitations rating. The greatest number of acres for construction and agricultural purposes receives a moderate rating while severe ranks highest for nursery stock production.

Table 10.1

Soils utility

Madison Township

	General construction			Agricultural use			Nursery stock		
	Acres	Hectares	%	Acres	Hectares	%	Acres	Hectares	%
Slight limitations	6,724	2,721	24.1%	434	176	1.7%	1,161	470	4.0%
Moderate limitations	12,724	5,149	45.6%	23,188	9,384	83.1%	11,356	4,596	40.7%
with drainage	n/a	n/a	n/a	n/a	n/a	n/a	7,115	2,879	25.5%
with irrigation	n/a	n/a	n/a	n/a	n/a	n/a	4,241	1,716	15.2%
Severe limitations	8,454	3,421	30.3%	4,241	1,716	15.2%	15,430	6,244	55.3%
Total	27,903	11,292	100.0%	27,903	11,292	100.0%	27,903	11,292	100.0%

Source: *Inventory of Ohio Soils: Lake County*, Ohio Department of Natural Resources, 1973.

SOIL LIMITATIONS: BUILDINGS

Soil limitations to buildings are highly generalized due to a great variety of conditions. Only the areas designated as slight are subject to unqualified construction. Areas marked moderate may be so designated because of one or more factors, for instance: the area south of the Grand River is limited mainly by seasonal wetness and a shallow depth to bedrock while the area between SR 54 and the Grand River is subject to seasonal wetness and slope stability hazards. With consideration of the problems, almost any area marked moderate is adaptable for construction.

Areas are designated severe are due to conditions which would be beyond reasonable expense to correct or which would cause additional hazards elsewhere if built upon. Floodplains are one example; to build there, it would be necessary to construct a high platform to prevent excessive moisture at foundation levels. If this were done, it would cause excessive flooding upstream and downstream. It would also increase erosion downstream. Such areas should be avoided.

SOIL LIMITATIONS: AGRICULTURE

Most of the land in Madison Township has a moderate soil limitation rating for agricultural uses. Severe ratings account for about 15% of the land, especially along waterways and the railroad corridor. The slight rating is present only in spotty areas around Middle Ridge Road.

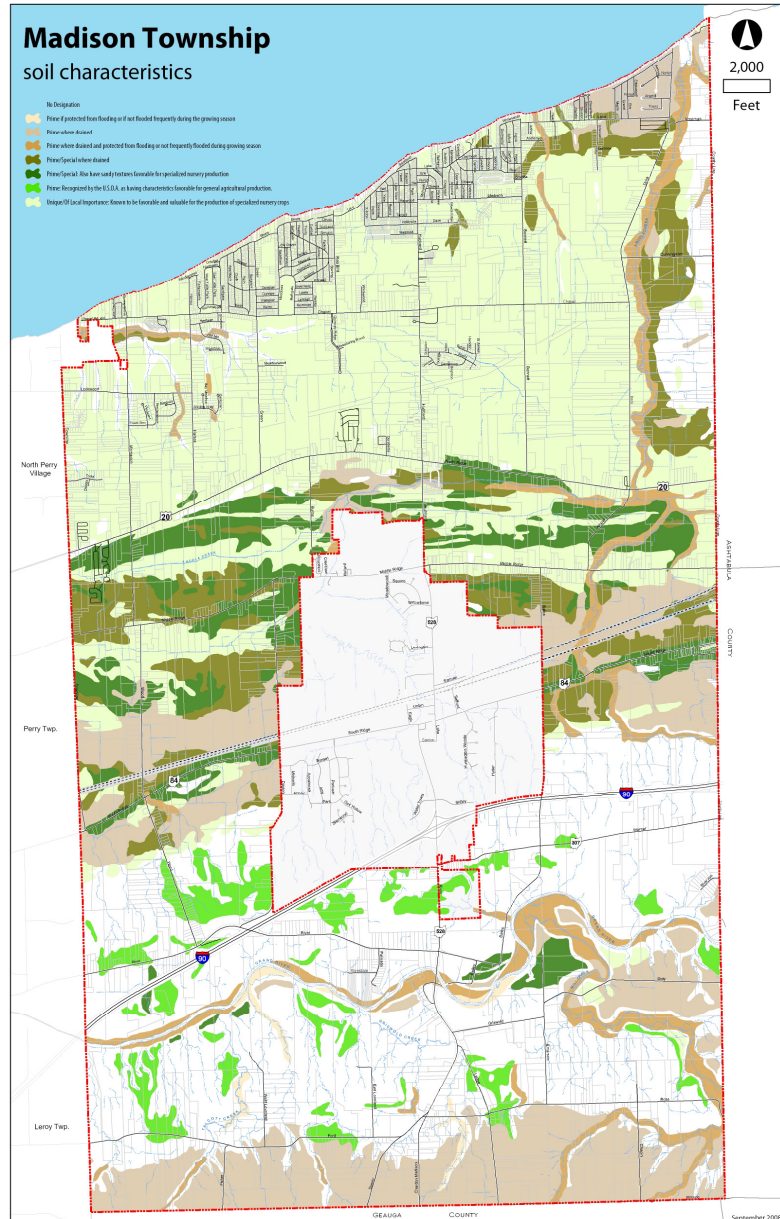
One of many challenges facing farmland preservation efforts is that the soils that are usually the best for agriculture – well-drained and sandy – are also ideal for residential construction.

SOIL SUITABILITY TO NURSERY STOCK

Production of nursery stock is accommodated by soils less conducive to the purpose than

generally supposed. Only about four percent of the township is given a slight limitation rating for nursery stock. Almost 41% is rated moderate and 55% is rated severe. Except for the ridges, most of the land south of North Ridge Road/US 20 is generally unsuitable. Most of the land north of US 20 is classified as moderate.

Soil condition is less critical for container production, which now dominates local nursery operations, than for field production. A container production bed can be built atop any soil type as long as drainage off the bed is achieved by way of a moderate natural slope or grading. Drainage is also important for the roadways between the beds, so vehicles and equipment have access throughout the year. Soil fertility level and pH are of no concern as they are for field production.



10.5 Geology

The geologic study was prepared by a professional geologist to complete the inventory of natural resources in the township. Geology is a science of the composition, structure and history of the earth.

The following is based on a report prepared for the previous comprehensive plan, *Geology for Planning*, which included physiography and geology, identification of resources, and engineering geology. The benefits of the geologic study are especially useful in the area of engineering geology, while inventory of the physiography and existing resources is a valuable reference.

PHYSIOGRAPHY AND GEOLOGY

Northeastern Ohio has been covered by three or four major ice sheets which began about one million years ago and ended about 10,000 years ago. The oldest glacial deposits have in most instances been removed by the last glaciation, the Wisconsinan.

Two distinct physiographic regions are present in Madison Township; the Lake Erie Plain and the foothills of the Appalachian front, also known as the Portage escarpment.

The Lake Erie Plain extends from the bluffs of Lake Erie southward to the Maumee II Beach Ridge, located between South Ridge Road and Interstate 90. Excluding the Church Creek stream valley, the Lake Plain is level to gently rolling in nature with a relief of no more than 20 feet in areas, resulting from stream valleys and ancient lake textures.

The Portage escarpment abuts the lake plain region at the Maumee II Ridge and rises to the southeast. Relief is level to gently rolling, at approximately 150 feet per mile. The Grand River Valley and several of its tributaries account for the only major relief features, with bluffs of 150 feet.

SURFICIAL DEPOSITS

Surface materials are mostly sands and gravels, clay and glacial till. Geographically from north to south, the texture of the township soils is graded from fine beach sand to coarse sands and gravels, then to clay till, and finally to a silty clay till in the extreme southern portion.

Underlying the sand is uniform blue, gray lake clay, except in isolated areas such as the northern stream reaches of Arcola Creek where the sand is underlain by Ohio or Chagrin shale. Floodplain deposits have been separated into three categories, fine loamy materials, coarse loam, and fine grained materials with shallow depth to bedrock. Generally, these deposits are thin and are highly irregular in nature.

BEDROCK

Bedrock outcrops are found mostly in Arcola Creek, Grand River and its tributaries. Bedrock is primarily shale and siltstone, but thin strata of sandstone, one or two feet (30 to 60 centimeters) in thickness are found occasionally.

SURFICIAL WETNESS

Wetness is an extreme problem in Madison Township resulting from a combination of permeability of the soil and depth to the water table. The water table varies seasonally and is influenced by the climate of the region. Most soils are saturated during the winter and early spring months. During the July and August the water table drops in response to the dryer conditions and evapotranspiration and recharge begins in early to mid-autumn.

Another factor controlling the water table is elevation. Low lying areas generally have a high water table. Low areas in front of ridges have a high water table which is induced by a hydraulic head. These are groundwater discharge areas and will be wet continuously in normal rainfall years.

RESOURCES

The second valuable product of the geologic study is existing resources. Resources in Madison Township are identified and described as sand and gravel deposits, groundwater, capability for waste disposal, bog iron clay, shale, oil, gas and salt. Criteria used in evaluating the resources are quality, location of the water table, thickness of the overburden, cost of removal, and the probable market.

Sand and gravel deposits are possibly the most valuable mineral resource in the township. The areas classified as good are mainly ridges where the texture of the deposits would be of suitable value for highway construction. The following are recommended for the deposits:

1. The preservation of sand and gravel resources through open space use, such as agriculture,
2. A planned method of excavation and material removal that would facilitate the redevelopment of the pit to another use, or
3. The return of the pit to further productive use, such as agriculture, recreation, or residential development.

GROUNDWATER

The major groundwater aquifer is the thick sand found at the ridges and north of North Ridge Road/US 20. The quantity of water obtainable depends on sand thickness and coarseness and Fine grained sand deposits generally yield less water than coarser grained sands of equal thickness. Water obtained from the sand is subject to pollution from waste disposal sources upgradient. Wells should be located upgradient from waste disposal facilities, especially in shallow sands.

Groundwater flows northward in most of the township. Knowing the direction of flow is essential when considering groundwater quality and pollution control, and sufficient data should be collected on the flow system for water management and pollution studies. Small quantities of water suitable for domestic use (1- 5 gallons per minute, 4-20 liters per minute) and of a lower quality are commonplace in the shale and clay aquifer south of Interstate 90 and underlying the sand aquifer north of the road. The poorer quality of water in shale is reflected in its longer residence in the ground. Brackish water is often encountered near the surface in the shale aquifer. Although the shales and siltstones are not considered good aquifers, they can produce domestic supplies up to 20 gallons per minute (80 liters per minute) in the southeast corner of the township.

SUITABILITY FOR CONSTRUCTION

The three gravel ridges, North Ridge, Middle Ridge and the South Ridge, have the fewest constraints for construction and provide good geologic properties and drainage characteristics. Constraints in these areas are the erosion-sensitive slopes when vegetation is removed and high potential for pollution of shallow groundwater wells.

Building space is limited on all ridges because of prior appropriation. Other suitable areas for construction lie between the South Ridge to the Grand River Valley and from the Grand River Valley to the township line. These areas contain deposits of clay and silt. A hardpan layer in the till that impedes the downward flow of water from septic tanks is the major problem for development in this area.

Several areas in the township are identified as restrictive for development because of slope instability. Slope areas of concern are the walls of the Grand River and tributaries, Arcola Creek, and the bluffs along Lake Erie. Active sliding is presently occurring in areas even under forest cover along the Grand River, which is a common occurrence with a base of interbedded shales and siltstones. Wave action, surface runoff and underground water seepage are the main causes of erosion along the Lake Erie shoreline. The author of the geologic study suggests the following to minimize the effects of slope failure:

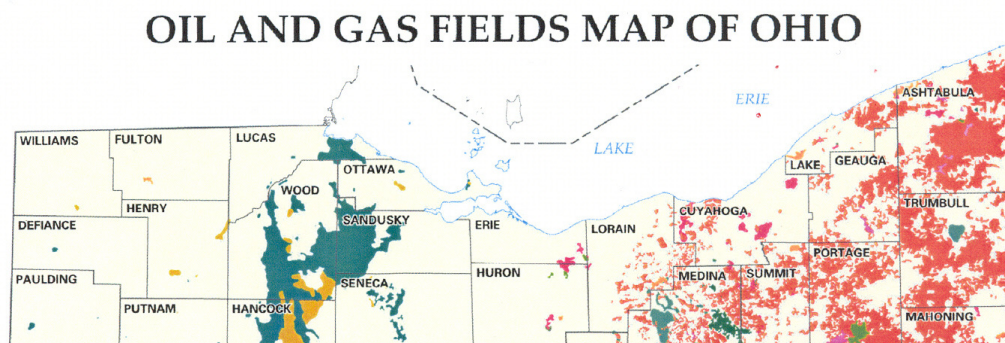
Grand River –

- (a) no construction within 50 feet of slope head
- (b) minimal vegetation disturbance within 50 feet of slope head
- (c) no construction on the slope at all. Cut and fill terracing would be unsatisfactory.

The Lake Erie bluffs are difficult and expensive to alter for erosion prevention. Purchase of land for use as natural areas is recommended.

10.6 Oil and natural gas

The Oil and Gas Fields Map of Ohio indicates a large gas field in Madison Township. This area (red on map) is a combination of three different geologic profiles: Devonian Ohio Shale and Siltstone, Silurian-Devonian “Big-Lime” and Silurian “Clinton/Medina” sandstone.



According to the Ohio Department of Natural Resources, there are 1,410 oil and natural gas wells in Lake County, about 270 of which are in Madison Township, and 30 in Madison Village. (Many of the counted wells appear on DNR oil and gas township maps as existing, but generally are very old and have not been field verified; they may or may not exist.) 2007 ODNR records indicate 543 producing wells in Lake County.

Most of Ohio's 62,902 active oil and gas wells are classified as "stripper" wells or wells that produce less than 10 barrels (42 gallons) of oil per day or less than 60,000 cubic feet of gas per day. The total production from wells in Madison Township or Madison Village is not tabulated.

Legislative changes in 2005 have largely exempted the oil and gas industry from local planning and zoning regulations. Community leaders may still provide comments on drilling activity during the permit notifications process that released by the Ohio Department of Natural Resources.

10.7 Treescape and woodlands

A popular belief is that, before European contact, America was dominated by impenetrable, relatively uniform forests that cloaked the landscape. The reality was quite different. Pre-settlement forests were quite dynamic, shaped by a myriad of both natural and human-caused influences, disturbances and catastrophic events that had a profound effect on the age, plant species and wildlife of the forest environment. Pre-settlement forests were a diverse mosaic of forest stands whose age, tree species and wildlife varied widely and reflected the disturbance history of the area.

The original forests covering the area that is now Madison Township and Madison Village were not pristine in the sense of being uninfluenced by humans. Native Americans in the area lived in fixed villages, and domesticated crops accounted for more than half of their diet. Thousands of acres were cleared for fields, and more was burned to improve game habitat, facilitate travel, reduce insect pests, remove cover for potential enemies, enhance conditions for berries and to drive game. It was a shifting type of agriculture. Fields and villages were abandoned when their natural fertility ran out, new forests were cleared, and the abandoned lands quickly reverted back to forest. In Madison Township, forests were cleared for farms and nurseries. As farmland was abandoned, forests slowly reclaimed the land.

The ecological subregion of Madison Township, as defined by the United States Forest Service, is: Humid Temperate Domain: Hot Continental Division: Eastern Broadleaf Forest (Continental) Province: Erie and Ontario Lake Plain Section.

The amount of land in Madison Township used for woodlots – a private area restricted to the growing of forest trees, specifically for building material or fuel – is not known. Lake County Cooperative Extension encourages sound woodlot management through educational programs and information sharing.

Many communities in the United States have tree preservation regulations. Under most tree preservation ordinances, site planning must consider the location of healthy, large native trees, and attempt to preserve them wherever possible. Trees subject to preservation cannot be removed unless they are replaced with trees of an equivalent caliper; for instance, a tree with a six inch diameter may be replaced with another six inch diameter tree, two trees with three inch diameters, or three two inch diameter trees, in addition to trees required by landscaping regulations. This plan recommends tree preservation requirements as part of updated landscape regulations.

Wooded land can still be developed with selective cutting of vegetation. However, many developers find it is more convenient to clear a site of all trees, to provide unlimited, easy access for construction vehicles. Tree preservation regulations can preserve the sylvan quality of the township, while still permitting development. Wildlife habitat is preserved, and the provided shade reduces energy costs. Privacy and home values are also enhanced. The village does not have tree preservation regulations. The township also does not have tree planting requirements for houses built on cleared land, such as former farm, nursery and reclaimed greenfield sites. The township should consider minimum planting requirements for new houses, to preserve forest cover, reduce the potential of urban heat islands, filter polluted air, and prevent soil erosion. Promoting urban forestry through mandatory tree planting requirements and municipal planting programs for public rights-of-way also has the benefit of protecting the local nursery industry.

10.8 Air pollution

According to the United States Environmental Protection Agency (EPA), Madison Village has one source of recorded commercial or industrial sources of toxic release inventory (TRI) pollutants; Chemmasters at 300 Edwards Street. Interstate 90, North Ridge Road/US 20, the

CSX/Norfolk Southern rail lines, and the fleets of area trucking and excavating firms, are additional sources of air pollution.

Increased tree cover, described in the treescape section, can help filter many airborne pollutants.

10.9 Noise pollution

Noise pollution in Madison Township comes from several sources, the most intrusive being heavy rail traffic along the CSX/Norfolk Southern corridor, and Interstate 90. As the population of the village grows, traffic on once-quiet rural county roads will increase, along with the resulting noise.

Commercial uses can be the source of constant noise, coming from car washes, loudspeakers and public address systems at gas stations and auto dealers, idling vehicles at drive-through windows, and loading areas and after-hours deliveries at supermarkets and big box stores. These uses are increasing in the township. Proactive adoption of regulations intended to regulate and buffer fixed point sources of noise – requiring large buffer zones, berms, and/or masonry walls between residential and commercial uses, especially loading areas, accessory car washes and trash enclosures; and/or restricting music and advertising at gas stations – can prevent the intrusion of unwanted noise into residential and environmentally sensitive areas. Noise pollution can be mitigated with sound walls; tree preservation and screening; conservation development in areas close to sources of noise, and large building setbacks from highways and loud industrial uses.

Noise pollution along Interstate 90, North Ridge Road/US 20, and the rail corridor will be difficult to suppress. New residential development, and other types of development where tenants may find excessive noise to be a nuisance, such as nursing homes, schools and hospitals, should not be built near Interstate 90 or the rail corridor.

10.10 Light pollution

Light spillover from development creates a nighttime glow above much of northeast Ohio, which many find to be unappealing. Light pollution also obscures clear views of the nighttime sky, an attribute often seen as a benefit of exurban and rural living. The sources of light pollution include poorly shielded lighting from commercial development – particularly auto dealerships, gas stations, and businesses with large parking lots that remain illuminated long after business hours – cobra-head style street lighting, sports facilities, and residential security lighting. Artificial light that is not properly directed downward can spill into the night sky and onto other properties, causing a nuisance to adjacent property owners. Madison Township has several sites that generate stray or excessive light; business parking lots with overly bright, poorly shielded under-canopy and pole lights on North Ridge Road/US 20, streetlights along many township and county roads, and poorly shielded outdoor lighting at residences.

Heavy foliage in some areas filters some stray artificial light, but light from taller light poles and lights in cleared areas can pass unblocked onto neighboring properties and into the night sky.

Curbing light pollution in Madison Township may not greatly improve views of the night sky, especially considering sources of artificial light in more heavily developed parts of the Cleveland metro area. Maintaining dark skies above the village will help to preserve a semi-rural character that residents value. Lighting can be addressed through the implementation of

requirements for light pole height, illumination levels, type of light, shielding, dispersal of light onto adjacent properties, and other elements in the township zoning resolution.

10.11 Goals and policies

Each primary paragraph (in bold type) is a statement of a goal. The subparagraphs are policies for implementing the goal. Some goals and policies related to land use are found in other elements.

NR-1 Activities and land uses that could harm waterways and watersheds are strongly discouraged.

- NR-1-p1 Promote continued preservation and restoration of natural habitat areas and high priority sites, in conjunction with county, state, federal and local government agencies.
- NR-1-p2 Work with county, state and federal agencies to purchase or acquire easements or development rights to high priority sites and areas of outstanding natural significance, for restoration and/or preservation.
- NR-1-p3 Support appropriate uses along streams that limit their impact and protect the environmental qualities of these natural systems, including parks and open space that preserve native vegetation and tree cover, and carefully planned residential development, institutional uses, and civic uses that preserves natural features near streams.
- NR-1-p4 Promote conservation along streams through the location of parks, open space, floodplain preservation, requirement of forested buffers, and use of conservation easements.
- NR-1-p5 Encourage green construction practices that will reduce groundwater runoff, such as permeable pavement and green roofs.
- NR-1-p6 Require subdivisions and development sites to be designed so no building sites are located in a 100 year flood zone, and where other improvements avoid flood plains, wetlands and other riparian features wherever possible.
- NR-1-p7 Establish a minimum riparian setback requirement for properties adjacent to or near waterways, streams, wetlands and floodplains.
- NR-1-p8 Keep floodplains that are not used for agricultural purposes in a natural state wherever possible, to ensure natural functions are maintained and not compromised.
- NR-1-p9 Seek continued preservation and restoration of natural habitat areas and high priority sites in watersheds, in conjunction with county, state, federal and local government agencies.
- NR-1-p10 Create a wetlands development and enhancement plan, in accordance with US Army Corps of Engineers requirements to create a wetlands mitigation bank.

NR-2 Appropriate soils will be considered in planning and development.

NR-2-p1 Preserve areas with unique soils, or soils of local significance. Development in such areas should be minimally disruptive, with as little impervious cover as possible, and planned in a manner that allows agricultural uses to remain and continue.

NR-3-p2 Discourage development on inappropriate sites, including areas with slopes that exceed 15%, and areas that are considered unsuitable for building and agriculture given the nature of the soils and underlying geology. Such areas should be set aside for public or private open space.

NR-2-p3 Consider soil drainage in assessing development. Avoid poorly drained soils wherever possible in locating buildings, or address such constraints through building and site improvements.

NR-3 The treescape of Madison Township will be preserved and enhanced.

NR-3-p1 Work with Lake County to implement development and design standards that promote preservation of healthy existing native trees, plants and groundcovers. Work with property owners and developers to consider alternative site designs to reduce tree loss in the development review process. Prohibit clearcutting of mature woodlots and forests, especially healthy second generation forests.

NR-3-p2 Implement stronger landscaping requirements for residential, commercial and industrial uses. Encourage retrofitting older, otherwise barren commercial and industrial sites with landscaped areas.

NR-3-p3 Expand urban forestry operations as funds become available. Urban forestry efforts should include planting of native trees, preferably those grown by local nurseries, in road rights-of-way, parks, and public land.

NR-3-p4 Encourage sound management of woodlots. Work with local government agencies, Cooperative Extension, and other groups to educate property owners about sustainable woodlot management.

NR-4 Air pollution will be minimized.

NR-4-p1 Monitor state and federal legislation intended to improve air quality, and support as appropriate.

NR-5 Noise pollution will be minimized.

NR-5-p1 Adopt design standards to address and reduce effects of noise pollution.

NR-5-p2 Require the use of earthen berms, noise-reducing pavement, and/or other features that will reduce or eliminate effects of highway noise, without deflecting it elsewhere.

NR-5-p3 Require buffering of residential uses located near sources of noise pollution, such as sound walls, berms, and existing and new vegetation. Residential development near Interstate 90 and the CSX/Norfolk Southern rail corridor should be sited or clustered to reduce or eliminate effects of highway noise.

NR-5-p4 Discourage placement of noise-sensitive land uses, such as schools, hospitals and nursing homes, adjacent to major arterials, unless they are well-buffered to reduce effects of highway noise.

NR-6 Light pollution will be minimized.

- NR-7-p1 Adopt lighting standards to address and reduce light pollution. This includes using cutoff fixtures, lighting building and pedestrian spaces only, low-impact lighting of parking lots and gas station canopies, and reducing light generated during non-business hours.
- NR-7-p2 Substitute conventional light fixtures at village facilities and along village roads with fixtures that maximize light downward, eliminate stray light and reduce light, as they are replaced.